

AbstractID: 1281 Title: Energy Dependence of The Sensitivity of A Europium Doped Barium Sulphate Thermoluminescent Sheet for 2-D Radiation Dosimetry

A thermoluminescent (TL) sheet film with a wide dynamic range has been developed for 2-dimensional dosimetry measurements in radiation therapy. The TL sheet is made of Teflon homogeneously mixed with small powders of thermoluminescent material ($\text{BaSO}_4\text{:Eu}$ doped). This TL sheet has been used to determine the 2-D dosimetric characteristics of low and high energy photon emitting sources for brachytherapy, and for megavoltage radiotherapy accelerators for external beam radiotherapy. Because TL sheet contains high Z material (Barium $Z=56$), its sensitivity has a large photon energy dependence, which will affect the accuracy of depth dose measurements, since the effective photon energy may change with depth. The dependence of the sensitivity of the TL sheet was measured using four independent methods: (1) In-air exposure to calibrated x-ray beams, and ^{137}Cs beam; (2) On top of a phantom exposure to calibrated x-ray beams from x-ray machines and ^{60}Co beam; (3) At d_{max} in a phantom irradiation from calibrated linac beams, and (4) In phantom irradiation using ^{103}Pd , ^{125}I and ^{192}Ir interstitial brachytherapy sources that have been calibrated using the AAPM TG-43 protocol. The results indicate that the sensitivity is relatively flat in the high energy range from 662 keV to 6 MV, and in the low energy range from 20 to 30 keV. However, it increased by almost a factor 10 as the photon energy increased from 30 to 60 keV. Linearity of the TL sheet response with dose was also confirmed in the range of 2 to 6 Gy at different photon energies.